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Report on the United Nations/International Astronautical Federation Workshop on an Operational Strategy for Sustainable Development using Space

(São José dos Campos, Brazil, 28-30 September 2000)

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I. Introduction

A. Background and objectives

1. The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) and the Vienna Declaration on Space and Human Development recommended that activities of the United Nations Programme on Space Applications promote collaborative participation among Member States at both the regional and international levels, emphasizing the development of knowledge and skills in developing countries.[1] At its forty-second session, in 1999, the Committee on the Peaceful Uses of Outer Space endorsed the programme of workshops, training courses, symposia and conferences planned for 2000.[2] Subsequently, the General Assembly, in its resolution 54/67 of 6 December 1999, endorsed the United Nations Programme on Space Applications for 2000.

2. The present report contains a summary of the presentations and discussions of the United Nations/International Astronautical Federation Workshop on an Operational Strategy for Sustainable Development using Space. Organized as part of the 2000 activities of the Office for Outer Space Affairs of the Secretariat under the United Nations Programme on Space Applications, the Workshop was co-sponsored by the European Space Agency (ESA), the Centre national d'études spatiales (CNES) of France, the Government of Brazil and the International Astronautical Federation (IAF). It was the tenth workshop of this series and was held in São José dos Campos, Brazil, in conjunction with the fifty-first Congress of IAF held in Rio de Janeiro. Organizational and programme support was provided locally by the National Institute for Space Research (INPE) of Brazil.

3. Space technology applications play an increasing role in international development efforts. New applications are constantly being developed in the fields of telecommunication, navigation and remote sensing. Earth observation data is the best available tool to study and monitor the global environment, including climate change, desertification, deforestation and agricultural and geological resources. The daily and global coverage of the planet provides precious information for environmental monitoring, natural resource management, disaster management and urban planning.

4. The potential benefits of space technology applications in developing countries are enormous. Satellite communications can be very efficient over large areas with only little ground infrastructure. Moreover, space technology can make a significant contribution to development in a region or country with a relatively small number of experienced professionals. Successful implementation of space technology applications has not yet taken place, however. Some major issues have to be resolved before this can happen. First of all, key policy and decision makers need to be convinced of the importance and benefits of space applications for their country in order to obtain political and financial support. Cost-benefit studies have to be undertaken to attract possible investors to provide funding for the implementation of operational use of space technology applications. To guarantee the lasting success of a given project, professionals and trained staff are required. The workshop addressed these and other issues while putting special emphasis on funding mechanisms for space-related projects in developing countries.

5. The present report covers the background and objectives of the workshop as well as presentations made, discussions held, observations made and conclusions reached by the participants. It has been prepared for submission to the Committee on the Peaceful Uses of Outer Space at its forty-fourth session and to its Scientific and Technical Subcommittee at its thirty-eighth session, in 2001. The participants will report to the appropriate authorities in their own countries. The proceedings of the workshop, together with a list of participants, will be made available through the Office.

B. Programme

6. During the course of the workshop, successful examples of the use of space technology in tropical regions to monitor deforestation, semi-arid areas and urban issues were presented. In addition to the technical presentations, a separate session addressed funding and financing strategies. The workshop was organized in six sessions, at which 19 papers were presented. In addition, 17 participants from developing countries provided an insight into the status of space technology applications in their respective countries. The presentations were followed by panel discussions

that gave participants an opportunity to voice their opinions.

7. Presentations were made by INPE, the Centre de Suivi écologique (CSE) of Senegal, the Institute of Technology Bandung of Indonesia, the Royal Jordanian Geographic Centre, the Universidad de la República (Uruguay), CNES, the Inter-American Development Bank (IDB), the Royal Centre for Remote Sensing of Morocco, the Foundation for Space Applications of Ghana, the Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), the Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales of Argentina, Surrey Satellite Technology Ltd. (United Kingdom of Great Britain and Northern Ireland), the IAF Power Committee, the Catholic University of Chile, the Centro de Levantamientos Aeroespaciales y Aplicaciones SIG para el Desarrollo Sostenible de los Recursos Naturales (CLAS) of Bolivia and the Office for Outer Space Affairs of the Secretariat.

8. Visits to the Laboratory for Integration and Testing, the Visitors Centre of INPE and the Centre for Weather Forecasts and Climate Studies (CPTEC) at Cachoeira Paulista were organized by the local organizing committee.

C. Attendance

9. The United Nations, on behalf of the co-sponsors, invited developing countries to nominate candidates for participation in the workshop. Selected participants were required to have a university degree or well-established professional working experience in a field related to the overall theme of the workshop. In addition, participants were selected on the basis of their working experience in programmes, projects or enterprises that were already using space technology applications or that could potentially benefit from using space technology. Special consideration was given to representatives of private industry and policy and decision makers.

10. Funds contributed by the Government of Brazil, the United Nations, ESA, CNES and IAF for the organization of the workshop were used to cover the international air travel and living expenses of 24 speakers and participants from developing countries. The co-sponsors also covered the cost of registration fees for participants from developing countries to participate in the 51st International Astronautical Congress, which was held immediately after the United Nations/IAF workshop.

11. The workshop was attended by 50 participants, from Argentina, Bolivia, Brazil, Canada, Chile, Colombia, the Czech Republic, Ecuador, France, Germany, Ghana, Greece, India, Indonesia, Japan, Jordan, Mexico, Morocco, Nicaragua, Pakistan, Peru, Romania, Senegal, the United Kingdom, the United States of America, Uruguay and Uzbekistan.

II. Observations and recommendations

12. During the panel discussions the participants expressed their views on many aspects of the use of space technology for sustainable development. The main observations and recommendations are summarized below.

13. In order to maximize the possibilities of funding, it was recommended that close cooperation be instituted at the regional level. Requirements for a development project to be successful in obtaining financial support were technical and economical sustainability and awareness of responsible decision makers.

14. As space technology applications were still very expensive, it was almost impossible for developing countries to maintain capacity and continue with work without the continued support of donor agencies or countries. It was therefore recommended that a development project create revenues to maintain the national capacity after the project was finalized.

15. Appropriate care should be taken to prepare documentation of development projects that could easily be used by politicians during the process of approval. The need was felt to put more emphasis on cost-benefit analysis of a project, since cost-effectiveness might persuade decision makers to support an initiative or project more than any other factor.

16. The participants stressed the need to involve local expertise in projects sponsored by the World Bank or international development banks. In order to improve communication between scientists, decision makers and donor agencies and to make scientists aware of the criteria that donor agencies applied in the selection of

projects, it was strongly recommended that presentations on funding and financing be included in future workshops.

17. The need to create awareness at the decision-making level was stressed. It was recommended that participating communities in developing countries be encouraged to organize, on a regular basis, training workshops/seminars with the objective of enhanced economic productivity, which should interest decision makers in the respective countries.

18. The information about free availability of the INPE Sistema de Processamento de Informacoes Geograficas (SPRING) software was appreciated and free distribution of similar software was encouraged. (See the report on the United Nations/ESA/Committee on Space Research Workshop on Data Analysis Techniques, held in São José dos Campos, Brazil from 10 to 14 November 1997 (A/AC.105/687).)

19. Operational sustainability requires the continued interest of end users who would like to have direct control of their natural resources. This in turn would require preparation and easy availability of databases and related technologies for use in the local environment. It is recommended that such a system be implemented at the local government/user's level and made available to users at no cost. Developing countries should be encouraged to set up such systems by provision of application software at a nominal cost.

20. To facilitate easy access to software for the development of various applications, the establishment of regional software banks, accessible via the Internet, may be required. These regularly updated software banks should keep track of the number and nature of users for sustainable development.

III. Summary of presentations

21. The workshop was opened with welcoming statements by the representative of the United Nations, the President of IAF and representatives of INPE, ESA, CNES and the Committee for Liaison with Industrialized Organizations with Developing Nations.

22. The two keynote addresses were given by T. Godai (IAF) and T. Krug (INPE). The first address, on promoting space utilization and sustainable global development through equal access to space information, introduced the theme of the workshop. In the second address, the speaker addressed the problem of deforestation, one of the most serious problems of Brazil. Subsequently, she presented an example of regional cooperation established during the Roraima fires in 1998. At that time the Cuiaba and Cotopaxi receiving stations collected data from both Land Remote Sensing Satellites (Landsat) and Defense Meteorological Satellite Program (DMSP) satellites.

A. Use of space technology in tropical regions

23. The representative of CSE (Senegal) provided an overview of the use of advanced information technology in west Africa in the field of natural resource management and environmental monitoring. It focused on the use of remote sensing in Senegal at CSE, one of the first institutions active in the field of remote sensing applications for environmental monitoring in Africa. Remote sensing is used in areas such as vegetation monitoring, agricultural statistics, crop yield forecasting, rainfall estimation, bush fire monitoring, land use and land cover mapping and environmental impact assessment. The representative highlighted the significant efforts undertaken in the use of modern technology to enhance access to and control over information and how that technology could contribute to the process of sustainable development.

24. The next presentation summarized satellite technology development for applications in Indonesia. Indonesian space activities have been directed primarily towards developing space technology applications as instruments for down-to-earth economic activities as well as environment monitoring and conservation. Awareness and initiatives in the private sector and universities to develop elements relevant for space technology applications for sustainable development, for telematics applications, for instance, have grown. In that regard, some activities related to the development of satellite technology have taken place and are intended to address the local and regional market as well as to support sustainable application of space technology in Indonesia, in particular remote sensing, communications and navigation for economic development.

B. Deforestation of tropical regions

25. The representative of Jordan informed the participants about geographic information system (GIS) modelling of land degradation in northern Jordan using satellite imagery. He presented a research project being conducted under the Badia Research and Development Programme. The programme aims to use satellite imagery to assess landcover change and GIS to evaluate land degradation.

26. A study on the impact of forest plantations on Uruguayan grasslands was presented by a representative of Chile, who is currently working on his doctoral thesis at the Universidad de la República in Uruguay. The main objective of the project is to understand the impact of replacing grassland with forests on different aspects of ecosystem functioning. The ecological impact of replacing grasslands with forests dominated by exotic species has not yet been evaluated as the change in the dominant plant functional group is occurring in the opposite direction to that in most areas of the world. The study combines remote sensing (Landsat Thematic Mapper), GIS, laboratory and field experiments and modelling (CENTURY model). The research strategy tries to fill the gap between large-scale (using space technology) and small-scale studies (classical ecological studies) to answer basic scientific questions.

27. The Amazon project has developed a new procedure to monitor and map deforestation in the Brazilian Amazon. The method is based on digital processing and supervised classification.

C. Funding and financing strategies for the operational use of space technology for sustainable development

28. The presentation by CNES focused on integrating existing funding mechanisms in the preparation of projects that include the use of space technology. The Congo Basin Rainforest Project represents a good example of a successful development project. The project is regional and is devoted to biomass conservation and sustainability.

29. Information technology is the current keyword for projects seeking support by funding banks. The presentation by the representative of IDB focused therefore on financing strategies for and experiences with projects using information technology for efficient, equitable and sustainable development. The goal is to seek avenues of cooperation with international organizations, civil society institutions and private sector enterprises to leverage the technical and financial resources available to promote the use and implementation of information technologies in the region. The Bank seeks to contribute to the efforts of its member countries in the region to attain sustainable use of the environment and of their natural resources by providing the technical and financial instruments necessary to achieve such goals and objectives in the short, medium and long term.

30. The constraints of remote sensing projects, as pointed out by the representative of the Royal Centre for Remote Sensing of Morocco, are reduced budgets, a lack of awareness among decision makers of the benefits of remote sensing techniques and the prohibitive costs of data acquisition. The Agrima project was presented as a successful project that combined the resources and expertise of different partners, allowing flexibility in financial management owing to the participation of the United Nations Development Programme and ensuring the durability of the results because of the high involvement of the partners. The successful implementation of remote sensing projects requires strong determination on the part of national policy makers, mechanisms for effective interaction between the various departments and agencies and competent technical experts.

31. The representative of Ghana presented the Ghana Environmental Resource Management Project, which was initiated after the United Nations Conference on Environment and Development, held in Rio de Janeiro in 1992,[3] to develop an environmental dataset for the management of national resources. Five institutions were commissioned to develop the datasets. Funding for the project came from the Danish Agency for Development Assistance and the International Development Agency of the World Bank. A critical assessment of the positive and negative impacts of the project was made, with particular reference to the objectives set out in the terms of reference of the funding, the spin-off benefits of the project and the roles it played in building the sustainable institutional capacity in space technology projects.

D. Semi-arid areas

32. The representative of Pakistan dealt in his presentation with the use of space technology in monitoring and locating water resources in semi-arid regions.

33. The characteristics of the zonda winds in the central-western area of Argentina have been observed by the Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales and the results obtained on cloud formations observed with satellite images were presented. The method of analysis was considered an effective complement to prediction of the event performed with the use of mathematical-statistical models.

34. Another presentation focused on remote sensing applications using images from the China-Brazil Earth Resources Satellite.

35. New space possibilities were presented by the representative of Surrey Satellite Technology Ltd., who gave an overview of opportunities in space for developing countries.

36. A special presentation of the IAF Power Committee informed the participants about space solar power, the solar power satellite SPS-2000 project for equatorial countries and the Grand-Bassin Wireless Power Transportation operational project on the island of Réunion (France).

E. Urban issues and space

37. The presentation by the representative of Chile focused on the application of space remote sensing to urban studies on different working scales, focusing mainly on the use of high-resolution images. This allows for urban planning on a range of scales from a general overview or regional scale to a local or municipal scale. The use of space-borne sensors on board several satellites was analysed in terms of accuracy, land use information and cost-benefit relationship. A special advantage of the technology is the synergy between space remote sensing systems and geomatic tools, such as GIS. This is especially valid for developing countries where the lack of basic cartography is the main limitation for adequate urban and land use planning.

38. GIS is a useful tool for urban applications. A definition of GIS was given and its use for urban planning, environmental studies and cadaster applications was described. It was recommended that remote sensing/GIS projects be institutionalized and incorporated into municipal policies.

39. The last presentation of the session introduced the SPRING software used in geotechnology applied to urban planning. The software was made freely available to the participants.

F. Presentation of the recommendations of UNISPACE III and review of follow-up activities of previous United Nations/IAF workshops

40. The Office for Outer Space Affairs informed the participants about the recommendations of UNISPACE III and the steps undertaken by the Office to start implementation of those recommendations.

41. A second presentation focused on the development of an Internet-based information repository, a recommendation of the last United Nations/IAF workshop, held in Enschede, the Netherlands, in 1999 (see A/AC.105/733). In the meantime the Office for Outer Space Affairs has prepared an implementation plan and invited the participants of the 1999 workshop to submit their suggestions and comments as well as to participate in the implementation group. The National Aerospace Laboratory (NLR) of the Netherlands offered to make its "clubs" system freely available to the various United Nations bodies and its information supplying partners as well as for developing countries. A brief presentation of the "clubs" system followed.

Notes

[1] See *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3), chap. I, resolution 1, para. 1 (e)(ii), and chap. II, para. 409 (d)(i).

[2] *Official Records of the General Assembly, Fifty-fourth Session, Supplement No. 20* and corrigendum (A/54/20 and Corr.1), para. 52.

[3] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992* (United Nations publication, Sales No. E.93.I.8 and corrigenda).